

The George Washington University Combinatorics Seminar

Friday, May 16, 11:00 - 12:00 p.m.

Monroe Hall, Room 267
2115 G Street, N.W., Washington, D.C.

Forbidden patterns in distinguishing randomness from determinism

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A surprising new application of pattern-avoiding permutations to dynamical systems is that they can be used to distinguish random from deterministic time series.

The orbits generated by piecewise monotone maps on one-dimensional intervals always have forbidden patterns, that is, ordered subsequences that do not occur in any orbit. The set of forbidden patterns of such a map is closed under consecutive pattern containment. This implies that, as n grows, all but an exponentially small fraction of patterns of length n are forbidden. On the other hand, in a random time series, every pattern appears with positive probability, which approaches one as the length of the time series increases. These ideas can be used to create tests to distinguish random from pseudo-random dynamics.

The talk will also discuss enumerative questions that arise when studying forbidden patterns of shift systems.

This is joint work with Jose M. Amigo and Matt Kennel.